INTRODUCTION

Much confusion and debate surrounds the issue of whether a woman should breastfeed her baby whilst continuing to use licit and illicit drugs. Many women and their partners are concerned about breastfeeding whilst taking drugs or drinking alcohol. Parents should be informed that for most drugs, the benefits of breastfeeding far outweigh the disadvantages, even with ongoing drug use. It is important to reassure the mother that the actual amount of drug that passes through to the breast milk is usually minimal and will have little effect on the newborn infant.¹

BENEFITS OF BREASTFEEDING

Breastfeeding is of great value to the psychological and physiological wellbeing of mother and infant. It should be encouraged and supported as a positive first line management strategy that will provide the best outcome for mother and infant.¹³ Babies born to substance using mothers are often preterm or of low birth weight and have an increased risk of sudden infant death.² In addition their mothers may smoke and/or come from disadvantaged backgrounds. These babies are particularly vulnerable and therefore have the most to gain from breastfeeding³ which also can also assist in the bonding process. It can also provide positive support for the mother in reinforcing the feeling that she is comforting and caring for her baby.¹²

Breastfeeding has been shown to benefit the long-term health of both mother and baby.¹, ⁵ The greater the level of drug use, as long as it is not contraindicated, the greater the potential benefits of breastfeeding.⁶ Ideally mother and baby should be transferred to the postnatal ward soon after delivery so that they can room in together and have ‘skin-to-skin’ contact. Separating mother and baby should be avoided wherever possible unless there are medical reasons for admission to the NICU. ‘Skin-to-skin’ contact, regardless of feeding choice, needs to be encouraged and will help the baby relax and sleep, regulate their body temperature, steady their breathing, help to facilitate mother-infant bonding and help get breastfeeding off to a good start.

The development of neonatal withdrawal symptoms, even if they require treatment, is not in itself an indication for admission to the NICU and treatment can be easily administered in the postnatal ward.¹, ⁴

BREASTFEEDING

Breastfeeding provides optimal nutrition for infants. The American Academy of Paediatrics recommends exclusive breastfeeding for the first 6 months of life, continued breastfeeding with the introduction of solid foods, followed by the continuation of breastfeeding for one year or longer.⁸ However, breastfeeding in the context of substance use involves a number of additional considerations. The risks and benefits of breastfeeding need to be discussed with the mother so that she can make an informed choice. It is important that the woman is given consistent and evidence-based information that does not exaggerate the perceived risk of breastfeeding, so that any feelings of guilt and concerns she may have about to her baby are put into perspective. Advice should be tailored to each woman’s particular situation so that she can make an informed choice. Contradictory advice from different health professionals should be avoided as it is likely to reduce confidence and cause confusion.¹

Drug use should be stable for breastfeeding to be appropriate. Unless contraindicated, breastfeeding should therefore be encouraged regardless of the type of drug or dosage used and indeed the greater the level of drug use the greater the potential benefits of breastfeeding. Breastfeeding assists in the bonding process and can provide positive support for the mother in reinforcing the feeling that she is comforting and caring for her baby. In addition breastfeeding will benefit the long-term health of both mother and baby.¹, ², ⁷

Injecting drug use should be discouraged whilst breastfeeding because of the risk of mother-to-baby blood borne virus transmission. Substance using mothers should be encouraged to breast feed in the same way as other mothers. Methadone treatment is not a contraindication to breastfeeding.⁹ Breastfeeding is contraindicated only if the mother is:

- HIV positive⁶
- Using cocaine or amphetamines⁹
- Heavy alcohol use (>8 units/day), or taking large amounts of non-prescribed benzodiazepines (because of sedative effects).¹
Women who are Hepatitis B positive can also safely breastfeed as soon as their newborn baby has received the first dose of immunoglobulin and Hepatitis B vaccine, normally administered shortly after birth. While breastfeeding increases the risk of vertical transmission of HIV, there is no evidence that this is the case with HCV infection, and immunisation of the neonate will prevent HBV transmission in almost all cases. Mothers who are Hepatitis C positive should be encouraged to breastfeed. The US Centers for Disease Control and Prevention (CDC) National Center for Infectious Diseases has found no evidence to suggest that breastfeeding spreads HCV, but recommends that HCV-positive mothers should consider abstaining from breastfeeding whilst their nipples are cracked or bleeding.

FACTORS AFFECTING THE CONCENTRATION OF DRUGS IN BREAST MILK

Nearly all drugs pass into the breast milk to some degree, with the exception of high molecular weight drugs such as heparin and insulin which are too large to cross biological membranes. Some of the important factors that affect drug transfer and concentration in breast milk are summarised in Table 1.

Table 1  Important factors affecting drug transfer and concentration in breast milk, adapted from Hale and Lee

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description and Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Plasma Level</td>
<td>The most important factor of drug penetration into milk. The higher the level of medication in the maternal plasma, the higher the drug concentration</td>
</tr>
<tr>
<td>T ½</td>
<td>The most commonly recorded adult half-life of the medication. Drugs that have a short half-life are preferred</td>
</tr>
<tr>
<td>Protein Binding</td>
<td>Drugs circulating in the maternal plasma are either freely soluble or bound to albumin in the plasma. The bound component stays in maternal circulation, while the free component transfers into the milk</td>
</tr>
<tr>
<td>Lipid Solubility</td>
<td>Drugs that are more lipid soluble penetrate into milk in higher concentrations. CNS–active drugs have unique characteristics that facilitate entry into milk and hence have higher levels in breast milk</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>The larger the molecule, the less likely it is to enter the milk</td>
</tr>
<tr>
<td>pH</td>
<td>The more basic the molecule, the more likely it is to be trapped or “ion trapped” in the milk due to its slight relative acidity</td>
</tr>
</tbody>
</table>

After a drug is administered (orally, intravenously or intramuscularly) it enters the maternal circulatory system, and is transported to other parts of the woman’s body including her breasts. Small water-soluble non-electrolytes pass into breast milk by simple diffusion through pores in the mammary epithelial membrane that separates plasma from milk. Equilibrium between the two fluids is rapid, and milk concentrations of drugs will be similar to plasma concentrations. In the case of larger molecules, only the lipid soluble, non-ionised forms pass through the membrane by crossing the cell wall and diffusing across the interior of the cell to reach the milk. The pH of milk is generally lower than that of plasma and milk can act as an “ion trap” for basic drugs. At equilibrium, these compounds can be concentrated in milk relative to plasma. Conversely, acidic drugs are inhibited from entering milk.

Because plasma proteins bind drugs to a greater extent than milk proteins, protein binding is also an important factor. Highly protein-bound drugs do not pass into milk in high concentrations. Lipid solubility favours passage of some drugs into milk because the fat component of milk can concentrate lipid soluble drugs. However, because milk contains only 3 to 5% fat, its capacity for concentrating drugs is limited.
Periodic emptying of the breast by the nursing infant and refilling with newly formed milk means that equilibrium between plasma and milk is rarely reached, so the rate of drug passage from plasma into milk is important in determining the concentration of a drug in milk. High lipid solubility and low molecular weight are factors that favour rapid passage into milk. The process is bi-directional so that when the concentration of non-ionised free drug is higher in milk than in plasma a net transfer of drug from milk to plasma occurs. As a result pumping and discarding milk does not appreciably hasten the elimination of most drugs from milk and does not have a marked effect on overall clearance of the drug from the mother’s body. Milk composition is variable both within and between feeds which may also affect the transfer of drugs into breast milk. Milk at the end of a feed (hind milk) contains considerably more fat than foremilk and may concentrate fat-soluble drugs.

A number of maternal, breast, and infant factors affect the passage of a drug into breast milk:

**Maternal factors**

During pregnancy maternal plasma volume increases by 30 to 50%, and cardiac output and glomerular filtration rate also increase proportionally. These factors may result in lower circulating concentrations of some drugs, especially those that are excreted readily, towards the end of the pregnancy. An increase in body fat during pregnancy may increase the volume of distribution of fat-soluble drugs; a decrease in plasma albumin concentrations during pregnancy increases the volume of distribution for highly protein-bound drugs such as anticonvulsants and selective serotonin reuptake inhibitors (SSRIs).

In the immediate postpartum period, a woman’s body undergoes dramatic physiological changes so that the pharmacokinetics of a drug administered to a lactating woman may be quite different immediately after birth than they are several weeks or months later, as maternal blood volumes fall, cardiac output falls, and albumin concentration increase as the body returns to a pre-pregnant state.

During the first four days postpartum there are large gaps between the alveolar cells in the milk buds which permits beneficial maternal proteins to enter the milk, but also allows for easier drug transfer. A surge in prolactin hormone levels after day 4 causes the alveolar cells to swell, closing the gaps and decreasing the amount of drug transferred into the breast milk.

It is also important to differentiate between the passage of a drug into colostrum, transitional milk, or mature milk, since the percentage of the drug present in breast milk will vary according to the milk composition.

Additional maternal factors that will affect the excretion of a drug into breast milk include:

- Dose
- Rate of absorption
- Route of drug administration
- Frequency of use
- Half-life of the drug/substance
- Time feed takes place in relation to drug administration
- Amount of subcutaneous fat
- Nutritional status
- Single versus multiple births
- Return of menses
- Stress
- Pharmacokinetics and pharmacodynamics of the drug in the lactating woman.

**Breast factors**

Factors that can influence the ability of a drug to gain access into breast milk include:

- Blood flow to the breasts
- pH of maternal plasma and milk
- Days postpartum
Drug ionisation
Protein binding in breast milk
Drug metabolism in breast milk
Possible reabsorption of the drug or its metabolites from breast milk back into the maternal circulation.

The amount of drug transferred from maternal plasma to breast milk and the rate at which this process occurs depends on a number of drug characteristics such as molecular weight, maternal plasma and breast milk protein binding, lipid solubility, pKa (which helps determine the ionisation of a drug at specific plasma and milk pHs), and the difference in pH between maternal plasma and breast milk.\(^\text{12}\)

**Infant factors**

Factors that will determine the amount of maternal drug that is available for absorption by a breastfed infant include\(^\text{12}\):

- Gestational age
- Body weight
- The infant’s sucking pattern
- The number of feeds per day
- The time the infant spends nursing
- The volume of milk consumed at each feed
- Absorption of the drug by the infant (this will depend on the infant's gastric pH, gastric emptying time, intestinal transit time, and bile acid and pancreatic enzyme production)
- Pharmacokinetic and pharmacodynamic effects of the drug on the term or preterm infant.

Preterm, ill and low birth weight infants are more likely to be affected by drugs in breast milk due to restricted or immature renal function and metabolic processes. If absorbed by the neonate, the effect of a particular drug will depend on the dose absorbed, as well as the pharmacokinetics and pharmacodynamics of the drug.\(^\text{11, 12, 17}\)

It is not always clear whether an infant is affected by drugs in breast milk. Drugs passed through breast milk to the breast feeding infant are metabolised in a similar way to a drug that is ingested orally. The drug must pass through the infant's gastrointestinal tract, where it may be denatured by the acidic environment. Other drugs are poorly absorbed orally and are consequently poorly absorbed into the infant's blood stream. Additionally, many drugs are isolated in the liver and never reach the plasma or enter the breast milk.\(^\text{11}\)

The concentration of most drugs in breast milk is exceedingly low and therefore insufficient to contraindicate breastfeeding. However, drugs that are active on the central nervous system are able to pass easily into breast milk. Cocaine, heroin, PCP, and amphetamines have all been described as having adverse effects on infants when transmitted in breast milk\(^\text{17}\) and are not recommended while breastfeeding.

**FACTORS AFFECTING MILK PRODUCTION**

The role of prolactin in the production of human milk is not totally understood, but it is vital to this process. Prolactin appears to stimulate the production and secretion of breast milk, whereas oxytocin stimulates the contraction of the myoepithelial cells that surround breast alveoli. Milk then enters the ducts to be ejected, the “letdown reflex” occurs, and milk is expelled from the breast. Adrenocorticotropic hormone, cortisol, growth hormone, insulin, and thyroxin are also needed for milk production and secretion, but their roles are not fully understood.\(^\text{12}\)

Maternal drug use can affect milk secretion and/or composition by affecting factors such as mammary gland development, milk secretion and hormones that control the lactation process. For example, dopamine agonists reduce prolactin secretion and are sometimes therapeutically used to stop lactation, whereas other drugs may have the opposite effect.\(^\text{12}\)
Anxiety, stress, and pain inhibit the ejection of milk by decreasing oxytocin. Amphetamines also inhibit prolactin release and, in high dosages, can interfere with lactation.

METHADONE OR BUPRENOPIRINE MAINTENANCE AND BREASTFEEDING

The Academy of Breastfeeding Medicine Protocol Committee suggests that ideally, substance using women who wish to breastfeed should undertake a comprehensive substance abuse treatment program. Although treatment alternatives such as Buprenorphine are available, Methadone remains the most commonly used treatment of choice for use of methadone for pregnant opioid using women in Australia and the United States of America. Methadone or Buprenorphine maintenance during pregnancy reduces the effects of cycling from intoxication to withdrawal when using illicit opioids and improves maternal and birth outcomes. Methadone is a licit, long-acting synthetic opioid that can be used as a substitute for shorter acting illicit opioids. Daily dispensing of methadone is the usual recommendation during pregnancy and breastfeeding in order to keep blood levels consistent and decrease the risk for women to share or sell their take home doses. Single daily doses of methadone are dispensed by authorised public clinics or community pharmacists directly to the client and must be consumed under supervision. The liquid dose is administered orally and the drug action lasts for 24 to 36 hours in comparison to a heroin dose which lasts about six hours.

Neonatal abstinence syndrome (NAS) occurs in approximately 60-80% of infants born to mothers maintained on methadone during pregnancy; these infants may require pharmacotherapy to manage the clinical signs of withdrawal. Research indicates that high maternal methadone dose is related to a higher incidence of NAS, however, methadone maintenance therapy is not in itself a contraindication to breastfeeding. Some authorities advocate breastfeeding at any methadone dose as long as there is no other active drug use occurring and no blood borne infections present.

The Australian Drug Strategy Guidelines makes the following recommendations:

- Breast milk contains only small amounts of methadone and mothers can be encouraged to breastfeed regardless of methadone dose provided that they are not using other drugs.
- Breastfeeding may reduce the severity of the neonatal abstinence syndrome.
- Women receiving high doses of methadone should be advised to wean their babies slowly to avoid withdrawal in the infant.

WEANING

The World Health Organisation recommends that babies should be exclusively breastfed for the first 6 months in order to achieve optimal growth, development and health. It also recommends that infants should continue to be breastfed for up to 2 years and beyond whilst gradually introducing complementary foods as part of the weaning process.

Whenever cessation of breastfeeding is desired the weaning process should be gradual. Eliminating a feeding every 2-3 days will achieve a comfortable transition for the infant and prevent engorgement in the mother. Abrupt weaning can be difficult for the mother and the infant and may result in the baby showing some signs and symptoms of drug withdrawal. Ideally, the weaning process should take several weeks to provide a slow drug withdrawal for the baby.

BOTTLE FEEDING

Many substance using women choose to bottle feed rather than breast feed. Social and cultural beliefs and norms are powerful influences on decision making about early infant feeding. An Australian study to identify factors associated with the abandonment of breastfeeding prior to hospital discharge found it to be associated with a number of psychosocial factors, including a perception by the mother that the infant's father either preferred formula feeding or was ambivalent about how the infant was fed, and whether the mother's own mother had ever breastfed. Parents should be supported to make an informed choice about how to feed their newborn baby. Having made their decision they should be supported by all of the professionals involved.

HARM MINIMISATION STRATEGIES

- Injecting drug use should be discouraged whilst breastfeeding.
- Breastfeed the infant immediately prior to drug use.
• Schedule drug use for times when the infant is usually settled or before the baby’s longest sleep period.
• Express milk prior to drug use to ensure that stored or frozen breast milk is available.
• Ensure that additional calories are available for the infant in the form of expressed and stored breast milk or formula.
• Do not breastfeed during the recommended non-breastfeeding period. This will vary according to the type of drug used and may be as long as 24-48 hours.
• Continue to express breast milk during the period of non-breastfeeding to maintain the milk supply.
• Discard all expressed breast milk.
• Monitor the infant for signs and symptoms of exposure to or intoxication from the drug.

**ADDITIONAL HARM MINIMISATION STRATEGIES FOR SPECIFIC SUBSTANCES**

The following section contains brief guidelines on the passage of both licit and illicit substances into human breast milk and the effects, if any, on the nursing infant. Drugs are categorised according to Hale’s lactation risk categories (Table 2A) and additional data from a brief review of the literature by Briggs et al (for definitions of breastfeeding recommendations see Table 2B).

**Explanation of the Terms T ½ and T max**

T ½ is the most commonly recorded adult half-life of the drug. If the half-life is short enough (1-3 hours) then the drug level in maternal plasma will be declining when the infant feeds again.  

T max is the time interval from administration of the drug until it reaches the highest (peak) level in the mother’s plasma or “time to max”. The mother should wait until the peak is subsiding or has at least dropped significantly before breastfeeding her infant.

**Table 2A Lactation Risk Categories, adapted from Hale**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L1 Safest</strong></td>
<td>Drug that has been taken by a large number of breastfeeding mothers without any observed increase in adverse effects in the infant. Controlled studies in breastfeeding women fail to demonstrate a risk to the infant and the possibility of harm to the breastfeeding infant is remote; or the product is not orally bioavailable in an infant.</td>
</tr>
<tr>
<td><strong>L2 Safer</strong></td>
<td>Drug that has been studied in a limited number of breastfeeding women without any increase in adverse effects in the infant and/or the evidence of a demonstrated risk that is likely to follow the use of the medication in a breastfeeding woman is remote.</td>
</tr>
<tr>
<td><strong>L3 Probably Safe</strong></td>
<td>There are no controlled studies in breastfeeding women; however, the risk of untoward effects in a breast fed infant is possible, or controlled studies show only minimal nonthreatening adverse effects. Drugs should be given only if the potential benefit justifies the potential risk to the infant.</td>
</tr>
<tr>
<td><strong>L4 Possibly Hazardous</strong></td>
<td>There is positive evidence of risk to a breast fed infant or to breast milk production, but the benefits from use in breast feeding mothers may be acceptable despite the risk to the infant (e.g., if the drug is needed in a life-threatening situation or for a serious disease for which safer drugs cannot be used or are ineffective).</td>
</tr>
<tr>
<td><strong>L5 Hazardous</strong></td>
<td>Studies in breastfeeding mothers have demonstrated that there is significant and documented risk to the infant based on human experience, or it is a medication that has a high risk of causing significant damage to an infant. The risk of using the drug in breastfeeding women clearly outweighs any possible benefit from breast feeding. The drug is contraindicated in women are breastfeeding an infant.</td>
</tr>
</tbody>
</table>
Table 2B  Definitions of Breastfeeding Recommendations (adapted from Briggs et al\textsuperscript{31})

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPATIBLE</td>
<td>Either the drug is not excreted in clinically significant amounts into human breast milk or its use during lactation does not, or is not expected to, cause toxicity in a nursing infant.</td>
</tr>
<tr>
<td>HOLD BREASTFEEDING</td>
<td>The drug may or may not be excreted into human breast milk, but the maternal benefit of therapy far outweighs the benefits of breast milk to an infant. Breastfeeding should be withheld until maternal therapy is completed and the drug has been eliminated (or reaches a low concentration) from her system.</td>
</tr>
<tr>
<td>NO (LIMITED) HUMAN DATA – PROBABLY COMPATIBLE</td>
<td>Either there is no human data or the human data are limited. The available data suggest that the drug does not represent a significant risk to a nursing infant.</td>
</tr>
<tr>
<td>NO (LIMITED) HUMAN DATA – POTENTIAL TOXICITY</td>
<td>Either there is no human data or the human data are limited. The characteristics of the drug suggest that it could represent a clinically significant risk to a nursing infant. Breastfeeding is not recommended.</td>
</tr>
<tr>
<td>NO (LIMITED) HUMAN DATA – POTENTIAL TOXICITY (MOTHER)</td>
<td>Either there is no human data or the human data are limited. The characteristics of the drug suggest that breastfeeding could represent a clinically significant risk to the mother such as further loss of essential vitamins or nutrients. Breastfeeding is not recommended.</td>
</tr>
<tr>
<td>CONTRAINDIATED</td>
<td>There may or may not be human experience, but the combined data suggest that the drug may cause severe toxicity in a nursing infant, or breastfeeding is contraindicated because of the maternal condition for which the drug is indicated. Women should not breast feed if they are taking the drug or have the condition.</td>
</tr>
</tbody>
</table>

**ALCOHOL (Ethanol)**

**SEDATIVE**

Lactation Risk: L3 (Probably safe)\textsuperscript{14}  
Briggs et al: Hold breastfeeding\textsuperscript{31}  
$T_{1/2} = 0.24$ hours, $T_{\text{max}} = 30$-90 minutes (oral)\textsuperscript{14}

The Australian Guidelines for all women (except when pregnant) recommend no more than 2 standard drinks per day.\textsuperscript{32}  
Binge drinking and long term high alcohol use creates the potential for harm for both mother and infant and should be avoided. Even in moderate amounts alcohol in breast milk seems to affect gross motor development in a dose-dependent manner.\textsuperscript{33}

**Effects of alcohol on breastfeeding**

1. Inhibits the release of oxytocins, reducing the letdown of milk and the amount delivered to the infant.\textsuperscript{14}  
2. Adult concerns: sedation, decreased milk supply, altered milk taste.\textsuperscript{14}  
3. There is some evidence that the presence of alcohol in breast milk has an overall effect of decreasing infant breast milk consumption by 23% but the reason for this is unknown.\textsuperscript{33}  
4. Breast milk alcohol levels closely mirror blood alcohol levels.\textsuperscript{34}
Neonatal sequelae

1. Infants are known to be sensitive to the hypoglycaemic effects of alcohol and fatalities have occurred when infants have been given alcohol to pacify them.33

2. Mild sedation has been observed in breastfed infants when maternal blood alcohol levels reach 300 mg/dl.35

3. May cause changes in sleep patterns such as drowsiness or deep sleep, impaired motor development, decreased milk intake, risk of alcohol-induced hypoglycaemia.35

4. Paediatric concerns: sedation, irritability, weak sucking, decreased milk supply, altered milk taste.14

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. The infant should be fed prior to maternal alcohol consumption.

2. Avoid breastfeeding during and for 2-3 hours after drinking alcohol.14

3. See Table 3 for the average length of time nursing should be delayed according to the number of drinks consumed and maternal body weight, before assuming a zero level of alcohol in breast milk.33

4. Withhold breastfeeding for 1-2 hours for every 30 grams of alcohol consumed (approximately two standard drinks).33

5. Chronic or heavy consumers of alcohol should not breastfeed.14

Table 3 Alcohol and breastfeeding: time (h:min) until a zero level of alcohol is reached for women of different body weights33

<table>
<thead>
<tr>
<th>Maternal weight</th>
<th>Drinks</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg</td>
<td>lb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.8</td>
<td>90</td>
<td>2:50</td>
<td>5:40</td>
<td>8:30</td>
<td>11:20</td>
<td>14:10</td>
<td>17:00</td>
<td>19:51</td>
<td>22:41</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.4</td>
<td>100</td>
<td>2:42</td>
<td>5:25</td>
<td>8:08</td>
<td>10:51</td>
<td>13:34</td>
<td>16:17</td>
<td>19:00</td>
<td>21:43</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54.4</td>
<td>120</td>
<td>2:30</td>
<td>5:00</td>
<td>7:30</td>
<td>10:00</td>
<td>12:31</td>
<td>15:01</td>
<td>17:31</td>
<td>20:01</td>
<td>22:32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72.6</td>
<td>160</td>
<td>2:10</td>
<td>4:20</td>
<td>6:30</td>
<td>8:40</td>
<td>10:50</td>
<td>13:00</td>
<td>15:10</td>
<td>17:20</td>
<td>19:30</td>
<td>21:40</td>
<td>23:50</td>
<td></td>
</tr>
</tbody>
</table>

Time is calculated from the beginning of drinking. Assumptions made: alcohol metabolism is constant at 15 mg/dl; height of the women is 162.56 cm (5 feet, 4 inches); 1 drink = 340 g (12 oz) of 5% beer or 141.75 g (5 oz) of 11% wine or 42.53 g (1.5 oz) of 40% liquor.

Example 1: for a 40.8-kg (90-lb) woman who consumed 3 drinks in 1 h, it would take 8 h 30 min for there to be no alcohol in her breast milk, but for a 95.3-kg (210-lb) woman drinking the same amount, it would take 5 h 33 min.

Example 2: for a 63.5-kg (140-lb) woman drinking 4 beers starting at 8:00 p.m., there would be a zero level of alcohol in her breast milk 9 h 17 min later (i.e. at 5:17 a.m.).
HALLUCINOGENIC AMPHETAMINES
(3, 4-METHYLENEDIOXY METHAMPHETAMINE [MDMA OR ECSTASY], MDEA, MDA, MDM [XTC, ESSENCE])

CENTRAL NERVOUS SYSTEM STIMULANT

Lactation Risk: L5 (Hazardous)\textsuperscript{14}
Briggs et al: Breastfeeding contraindicated (for non-medical use)\textsuperscript{31}

\( T\frac{1}{2} = <8 \text{ hours}, \ T_{\text{max}} = 1-5 \text{ hours}^{14} \)

Ecstasy or MDMA is a synthetic, psychoactive drug chemically similar to the stimulant methamphetamine and the hallucinogen mescaline. MDEA can also be dangerous to health and, on rare occasions, lethal.\textsuperscript{36}

MDMA exerts its primary effects in the brain on neurons that use the chemical serotonin to communicate with other neurons. The serotonin system plays an important role in regulating mood, aggression, sexual activity, sleep, and sensitivity to pain.\textsuperscript{37} According to the National Drug Strategy Household Survey, in 2010, 10.3% of Australians aged over 14 years had used ecstasy at some stage in their life.\textsuperscript{37}

Ecstasy tablets may contain other substances in addition to MDMA, such as ephedrine (a stimulant); dextromethorphan (DXM, a cough suppressant that has PCP-like effects at high doses); ketamine (an anaesthetic used mostly by veterinarians that also has PCP-like effects, which has also been implicated in some instances of “date rape”); caffeine; cocaine; and methamphetamine. The combination of MDMA with one or more of these drugs may be inherently dangerous; use of ecstasy with substances such as marijuana and alcohol are likely to exacerbate the risk.\textsuperscript{36}

**Effects of ecstasy on breastfeeding**

1. No published information on ecstasy excretion into breast milk and ecstasy use in breastfeeding was located.\textsuperscript{38}
2. The molecular weight is low enough to suggest that excretion into breast milk does occur. The closely related drug amphetamine is concentrated in breast milk, with milk to plasma ratios ranging from 2.8 to 7.5.\textsuperscript{31}
3. Because MDMA can interfere with its own metabolism (breakdown within the body), potentially harmful levels can be reached by repeated drug use within short intervals.\textsuperscript{36}
4. Psychological effects on the mother include confusion, depression, sleep problems, drug craving, and severe anxiety. These problems can occur during and sometimes days or weeks after taking MDMA.\textsuperscript{36}
5. Adult concerns: hallucinations, agitation, seizures, acute paranoid psychosis, extreme hypertension, hyperthermia, tachyarrhythmia. Effects are largely dose-dependent.\textsuperscript{14}

**Neonatal sequelae**

Research in animals links MDMA exposure to long-term damage to neurons that are involved in mood, thinking, and judgment. A study in nonhuman primates showed that exposure to MDMA for only 4 days caused damage to serotonin nerve terminals that was evident 6 to 7 years later. While similar neurotoxicity has not been definitively shown in humans, the wealth of animal research indicating MDMA’s damaging properties suggests that MDMA is not a safe drug for human consumption.\textsuperscript{36}

**HARM MINIMISATION STRATEGIES**

**Additional harm minimisation strategies for breastfeeding**

1. Breastfeed the infant prior to ecstasy use
2. DO NOT breastfeed for 24 – 48 hours after ecstasy use.
RACEMIC AMPHETAMINES INCLUDING DEXTROAMPHETAMINE, DEXEDRINE, METHAMPHETAMINE [SPEED, METH, CHALK, CRYSTAL, ICE]

CENTRAL NERVOUS SYSTEM STIMULANT

Lactation Risk: L3 in clinical doses and L5 (Hazardous) if abused

Briggs et al: Limited Human data – potential toxicity. Contraindicated (non-medical use)

T½ = 6-8 hours (Dextroamphetamine), 4-13.6 hours (Methamphetamine)

T max = 1-2 hours (Dextroamphetamine)

Effects of amphetamines on breastfeeding

1. Inhibits prolactin release and can reduce breast milk supply.
2. Concentration found in breast milk is 2.8 – 7.5 times those found in maternal plasma.
3. Amphetamines have been detected in infant urine following maternal therapy.
4. Adult concerns include both psychological (anxiety, aggressive behaviour, psychosis) and physical (anorexia, insomnia, tachycardia, hyperactivity) effects.

Neonatal sequelae

1. Paediatric concerns: possible insomnia, irritability, anorexia, reduced weight gain or poor sleeping patterns.

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. Do not breast feed for 24 hours after the non-clinical use of dextroamphetamine.
2. Do not breast feed for at least 48 hours after methamphetamine use.
3. Express breast milk to maintain supply, discard expressed breast milk.
BENZODIAZAPINES
SEDATIVE / HYPNOTIC

Lactation Risk: L3 (Probably safe); L4 (Possibly hazardous) if used chronically\textsuperscript{14}

Briggs et al: Limited Human Data – Potential Toxicity\textsuperscript{31}

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Benzodiazepines belong to a group of drugs known as minor tranquillisers. Benzodiazepines are depressants and slow the messages going to and from the brain to the body, including physical, mental and emotional responses. According to the National Drug Strategy Household Survey, in 2010, 3.2% of the Australian population had used tranquillisers/sleeping pills (including benzodiazepines) for non-medical purposes at some stage in their lifetime.\textsuperscript{37}

Benzodiazepine compounds fall into three major categories: long-acting compounds (diazepam, chlordiazepoxide, chlorazepate, flurazepam, halazepam, and prazepam); intermediate-acting compounds (clonazepam, lorazepam, quazepam, and estazolam); and short-acting compounds (alprazolam, oxazepam, temazepam, midazolam, and triazolam).

Effects of benzodiazepines on breastfeeding
1. Breast feeding is not recommended with long term/high doses of long acting benzodiazepines.\textsuperscript{35}
2. If regular therapy is required during breast feeding, the use of low dose, shorter-acting benzodiazepines is preferable.\textsuperscript{14}
3. Diazepam and its metabolites are excreted in the breast milk of nursing mothers in low concentrations, depending on the dosage, at concentrations of 0.2 – 2.7 times those found in maternal plasma.\textsuperscript{35}
4. There are no reports of adverse effects associated with the use of diazepam, lorazepam or quazepam during lactation. Prazepam is concentrated in milk relative to simultaneous maternal plasma concentrations.\textsuperscript{17}
5. Adult concerns: sedation, drowsiness, dizziness, blurred vision, dry mouth, headache, fatigue, ataxia, slurred speech, tremors, amnesia, mental confusion.\textsuperscript{14}
Neonatal sequelae
1. Neonatal withdrawal symptoms have been noted after exposure to alprazolam during breastfeeding.\textsuperscript{14}
2. Long-acting benzodiazepines such as diazepam and its metabolites can accumulate in infants, and have the potential to cause lethargy, sedation, and weight loss in infants. These effects quickly resolve after breastfeeding is discontinued.\textsuperscript{35}
3. Abrupt weaning or rapid cessation of long-term treatment or use may cause infant withdrawal symptoms.\textsuperscript{35}
4. A recent study by Kelly et al.\textsuperscript{41} found that adverse outcomes, specifically sedation, were identified in only 1.6% (2 out of 124) infants.
5. Paediatric concerns: Some reports of lethargy, sedation, poor suckling, withdrawal.\textsuperscript{14}

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding
1. Breastfeeding should be withheld for 6-8 hours after a single dose of benzodiazepine.\textsuperscript{35}
BUPRENORPHINE
NARCOTIC AGONIST-ANTAGONIST ANALGESIC

Lactation Risk: L2 (Safer)\textsuperscript{14}
Briggs et al: No (Limited) human data – potential toxicity\textsuperscript{31}
\(T\frac{1}{2} = 23-30\) hours sublingual, \(T_{\text{max}} = 15-30\) minutes\textsuperscript{14}

Buprenorphine is used as an alternative to methadone for maintenance and detoxification treatment. Dispensed as a high-dose sublingual tablet, this long-acting opioid lasts for up to 48 hours and prevents or relieves opioid withdrawal symptoms, reduces cravings, and blocks the effects of illicit opioids if used concurrently. Due to the long half-life of the product, once stabilised, it is administered on alternate days under supervised conditions, thus making the product more convenient for some users. Dispensation of buprenorphine occurs on a dose by dose model through public clinics or community pharmacists.\textsuperscript{22, 42}

In recent times, buprenorphine has been approved for the treatment of opiate dependence\textsuperscript{14}. Recent data suggests that when used to treat opioid addiction, buprenorphine delivers improved stabilisation for the mother and fewer withdrawal symptoms in the newborn when compared with methadone.\textsuperscript{35}

Effects of buprenorphine on breastfeeding

1. Information on the excretion of buprenorphine into breast milk remains scant and requires further studies to establish the potential effects on a breastfed infant.\textsuperscript{43}
2. Adult concerns: itch, sedation, hallucinations, respiratory depression, dizziness and euphoria\textsuperscript{14}
3. The use of buprenorphine is acceptable in nursing mothers due to its poor bioavailability and low drug concentrations found in the serum and urine of breastfed infants.\textsuperscript{34}
4. While studies on buprenorphine are limited, there is no evidence that its use with result in adverse effects on the infant.\textsuperscript{16}

Neonatal sequelae

1. There is some evidence that the buprenorphine in breast milk decreases infant breast milk consumption, possibly due to central nervous depression in mother and infant, resulting in lower weight gain.\textsuperscript{31}
2. In one study, the infant of a buprenorphine-maintained mother who was breastfed for six months showed normal development at six and twelve-month developmental assessments.\textsuperscript{44}
3. A study that measured the daily buprenorphine dose ingested by a newborn in breast milk over an 8-week period found it to be very low (3.28 micrograms).\textsuperscript{45}
4. In another study, no withdrawal signs were observed when breastfeeding was abruptly ceased due to a chest infection.\textsuperscript{45}

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. If a decision is made to continue breastfeeding while the mother is on buprenorphine, neonates and infants should be regularly monitored for weight gain and developmental progress.
2. If women decide to wean their babies from breast milk, they should be advised to wean their babies slowly to avoid possible withdrawal in the infant.\textsuperscript{14}
3. Observe infants for withdrawal signs if breastfeeding is stopped abruptly.\textsuperscript{34}
CAFFEINE

CENTRAL NERVOUS SYSTEM STIMULANT

Lactation Risk: L2 (Safer)\(^{14}\)
Briggs et al: Compatible\(^{31}\)

\(T_{1/2} = 4.9\) hours, \(T_{\text{max}} = 1\) hour\(^{14}\)

Effects of caffeine on breastfeeding

1. The amounts of caffeine in breast milk after maternal ingestion are probably too low to be clinically significant. Peak concentration levels of caffeine occur in breast milk within approximately 1 hour after ingestion.\(^{31}\)
2. Some evidence suggests that the chronic ingestion of caffeine may decrease the iron content of milk.\(^{14}\)
3. Adult concerns: agitation, irritability and poor sleeping patterns.\(^{14}\)

Neonatal sequelae

1. The elimination half-life of caffeine in term newborns and preterm babies is approximately 80 hours and 97.5 hours respectively.\(^{31}\)
2. Accumulation may occur in infants whose mothers ingest high levels of coffee or caffeinated beverages and can lead to irritability and insomnia.\(^{31}\)
3. Neonatal side effects can be avoided by limiting maternal coffee consumption.
4. Effects are more likely in preterm and newborn infants because of a diminished ability to metabolise caffeine.\(^{13}\)

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. Breastfeed infant prior to ingesting caffeine.
2. Monitor infant for signs/symptoms of exposure to or withdrawal from caffeine
3. It is advised that during breastfeeding, caffeine consumption should be limited to 2 to 4 cups of coffee, tea or cola per day.\(^{46}\)
CANNABIS (MARIJUANA, HASHISH)

HALLUCINOGEN

Lactation Risk: L5 (Hazardous)\textsuperscript{14}
Briggs et al: Contraindicated\textsuperscript{31}
\(T_{1/2} = 25-57\) hours\textsuperscript{14}, \(T_{\max} = \) Not stated

Effects of cannabis on breastfeeding

1. \(\Delta-9\)-Tetrahydrocannabinol (\(\Delta-9\)-THC or THC), the principal psychoactive compound in marijuana, is rapidly distributed to the brain and adipose tissue, and binds extensively to plasma.\textsuperscript{35}
2. THC is excreted and accumulates in breastmilk.\textsuperscript{35}
3. An infant ingests approximately 0.8% of its mother’s dose/kg from one joint. In heavy users the milk-to-plasma ratio can be as high as 8:1.\textsuperscript{14}
4. Studies on animals suggest that marijuana can decrease the amount of milk produced by suppressing prolactin production.\textsuperscript{14}
5. Adult concerns: sedation, weakness, poor feeding patterns and possibly, reduced milk production.\textsuperscript{14}

Neonatal sequelae

1. Reports on the effects of prenatal marijuana exposure on the length of gestation, fetal growth, and neurobehavioural effects are conflicting. Confounding factors such as possible impurities in the drug and concomitant tobacco smoking may be responsible for these inconsistent reports.\textsuperscript{14}
2. One study\textsuperscript{14} found that there was no difference noted in the outcomes on growth, mental and motor development in the infants of 27 women who regularly smoked marijuana whilst breast feeding.
3. Short-term effects of THC exposure in infants have been reported as sedation, lethargy, weakness and poor feeding habits.\textsuperscript{35}
4. The effects of long term exposure are unknown but may include delayed motor development; additional research is needed to determine the outcomes.\textsuperscript{39}

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. Withhold breastfeeding for several hours after occasional marijuana use and use caution to avoid exposing the infant to marijuana smoke.\textsuperscript{35}
2. Smoke outside the house or car.
3. Smoke only after feeding.
COCAINE
SYMPATHOMIMETIC / CENTRAL NERVOUS SYSTEM STIMULANT

Lactation Risk: L5 (Hazardous)\textsuperscript{14}
Briggs et al: Contraindicated (systemic), Compatible (topical)\textsuperscript{31}

\(T_{1/2} = 0.8\) hours, \(T_{\text{max}} = 15\) minutes\textsuperscript{14}

According to the National Drug Strategy Household Survey, in 2010\textsuperscript{37}, 7.3% of Australians aged over 14 years had used cocaine at some stage in their life. Cocaine hydrochloride is most commonly "snorted". It can also be injected. Some people rub it into the gums, where it is absorbed into the bloodstream or add it to a drink or food. Freebase and crack cocaine are usually smoked. Based on the toxicity exhibited in breastfed infants exposed to cocaine, maternal cocaine use should be strongly discouraged during breastfeeding.

Effects of cocaine on breastfeeding
1. The exact amount of cocaine transmission to breast milk has not yet been established but significant secretion is suspected.\textsuperscript{14}
2. Cocaine and its metabolites have been found in the urine of nursing infants 24-36 hours after maternal use.\textsuperscript{35}
3. Based on current evidence, cocaine should be avoided while breastfeeding.\textsuperscript{14}
4. Adult concerns: nausea, vomiting, hypertension, tachycardia, seizures.\textsuperscript{14}

Neonatal sequelae
1. Infants are less able than adults to metabolise cocaine and may accumulate the drug as a result.\textsuperscript{35}
2. Serum cholinesterase, which is needed to metabolise the drug, is low in newborns.\textsuperscript{35}
3. Some studies have found that nursing infants exposed to cocaine can be difficult to feed.\textsuperscript{47}
4. Potential adverse effects in the infant include irritability, vomiting, diarrhoea, tremulousness, hypertension, tachycardia, seizures and dilated pupils.\textsuperscript{14}
5. In one study an infant breastfed 5 times over a 4-hour period during which the mother ingested cocaine, displayed symptoms three hours after the first dose. These included irritability, vomiting, diarrhoea, tremulousness, increased startle reflex and hyperactive Moro reaction.\textsuperscript{31}
6. In another study an infant exposed to cocaine through a topical application to the nipples to treat nipple soreness, experienced seizures and was found gasping, choking and blue 3 hours after feeding (acute symptoms of cocaine exposure).\textsuperscript{31}

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding
1. Withhold breastfeeding for at least 24 hours after occasional cocaine use.
2. Mothers should be warned that it is extremely dangerous to apply cocaine topically to treat nipple soreness.\textsuperscript{31}
GAMMA-HYDROXYBUTYRATE (GHB)
SEDATIVE/HYPNOTIC

Lactation Risk: L5 (Hazardous)

Briggs et al: Not reviewed

$T_{1/2} = 20 – 60$ minutes, $T_{\text{max}} = 45$ minutes

GHB, also known as “Liquid Ecstasy” and “Grievous Bodily Harm”, is a rapidly acting, naturally occurring short-chain fatty acid related to gamma-aminobutyric acid (GABA). It rapidly produces effects that have been likened to a combination of alcohol (euphoria, reduced anxiety, drowsiness, loss of motor control) and ecstasy (enhanced sensuality, emotional warmth). The illicit use of GHB and its precursors gamma-butyrolactone (GBL) and 1, 4-butanediol (1, 4-BD) has steadily grown in the US, Europe, the UK and Australia. According to the National Drug Strategy Household Survey for 2010, 0.8% of Australians aged over 14 years had used GHB at some stage in their life.

GHB is used recreationally at raves (“liquid ecstasy”) and to heighten sexual pleasure, as well as being used as a “health product” for sleep and bodybuilding. It has also been used in drug rape and other drink-spiking crimes. The amnesia-producing effects of the benzodiazepines make the victim unable to describe the events after she or he has recovered. The effects of GHB are exacerbated when taken with alcohol or other drugs, making it especially dangerous when used to spike an alcoholic drink. GHB takes effect within 10-20 minutes and the effects last for 1-3 hours. It is thought to be eliminated from the body in around 12 hours.

Effects of GHB on breastfeeding

1. Safety in lactation has not been established.
2. After ingestion, GHB is rapidly absorbed and quickly crosses the blood-brain barrier. It is not protein bound and is rapidly metabolised and excreted through the lungs. Since it is not protein bound it is likely to be excreted in breast milk in significant concentrations.
3. Adult concerns: loss of muscle tone, decreased respiratory rate, loss of inhibitions, bradycardia to tachycardia, nausea, agitation, hallucinations, vomiting and coma.

Neonatal sequelae

1. The effects of GHB on infants are not documented but it likely to enter breast milk due to its chemical make up.

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. Express breast milk and discard for at least 12 to 24 hours after GHB use (depending on amount taken).
HEROIN (DIACETYLMORPHINE OR DIAMORPHINE) AND OTHER OPIOIDS
NARCOTIC AGONIST ANALGESIC

Lactation Risk: L5 (Hazardous)\(^\text{14}\)
Briggs et al.: Contraindicated\(^\text{31}\)
\(T_{\frac{1}{2}} = 1.5-2\) hours, \(T_{\text{max}} = 0.5-1\) hour\(^\text{14}\)

Effects of heroin & other opioids on breastfeeding

1. At therapeutic doses, most opioids, such as morphine, meperidine, methadone, and codeine are excreted into milk in only minimal amounts compatible with breastfeeding.\(^\text{14,35}\) Heroin, however, is excreted into breast milk in sufficient quantities to cause addiction in the infant.\(^\text{35}\)

2. Intravenous substance use increases the risk of the mother contracting blood borne viruses through shared equipment and engaging in unprotected sex. The risk of infection of the infant through transmission of blood borne viruses via breast milk is therefore increased.

Neonatal sequelae

1. With prolonged use all narcotics may produce withdrawal syndrome in neonates when ceased.\(^\text{52}\)
2. Levels in breast milk can be high enough to alleviate withdrawal symptoms in the infant.\(^\text{4}\)
3. Chaotic substance use by a breastfeeding mother may result in the infant receiving fluctuating doses of opioids which are potentially harmful for the infant.\(^\text{14}\)
4. Adverse effects include sedation, withdrawal, tremors, restlessness, vomiting and poor feeding (see Modified Finnegan Neonatal Abstinence Score Sheet and Instructional Manual).\(^\text{14}\)

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. Delay breastfeeding after opiate use for 24-48 hours depending on drug/substance used and the uncertainty associated with the composition of street drugs.\(^\text{35}\)
2. Commence treatment regime if possible, e.g. methadone program.\(^\text{35}\)
INHALANTS AND VOLATILE SUBSTANCES (PETROL, GLUE, AEROSOL CANS, BUTANE GAS, ETC)

VARIOUS (PSYCHOACTIVE, ANAESTHETICS, VASODILATORS, ETC.)

Lactation Risk: L2 -L5 (Depends on component compounds)
Briggs et al: Limited human data – depends on component compounds

Types of Inhalants
Inhalants are breathable chemical vapours that are intentionally inhaled because of their psychoactive or mind-altering effects. These substances are often common household products that contain volatile solvents or aerosols and fall into three categories:

Solvents
Solvents such as benzene, toluene and xylene used in industrial or household solvents or present in solvent-containing products (such as paint thinners or removers, degreasers, dry-cleaning fluids, petrol, and glue); or art or office supply solvents containing substances such as trichloroethylene (such as correction fluids, felt-tip-marker fluid, and electronic contact cleaners).

Gases
Can be either those used in household or commercial products (including butane lighters and propane tanks, whipped cream aerosols or dispensers, and refrigerant gases); household aerosol propellants and associated solvents (in items such as spray paints, hair or deodorant sprays, fabric protector sprays, and aerosol computer cleaning products); or medical anaesthetic gases, such as ether, chloroform, halothane, and nitrous oxide (“laughing gas”).

Nitrites
Can be either organic nitrites (such as cyclohexyl, butyl, and amyl nitrites, commonly known as “poppers” or volatile nitrites often sold in small brown bottles and labelled as “video head cleaner” “room deodoriser” “leather cleaner” or “liquid aroma”).

Effects of inhalants on breastfeeding
1. The effects of inhaling volatile substances during breastfeeding have not been fully researched. While the major quantities of inhalants possibly do not pass through breast milk, breastfeeding whilst affected your inhalants is not safe and is not recommended.

Neonatal sequelae
1. The neonate’s nervous system continues to develop after birth and nursing infants may be more sensitive to the neurotoxic effects of solvents.

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding
1. Breastfeeding should be avoided if the mother is intoxicated on inhalants.
LYSERGIC ACID DIETHYLAMIDE (LSD)

HALLUCINOGEN

Lactation Risk: L5 (Hazardous)\textsuperscript{14}

Briggs et al: Contraindicated\textsuperscript{31}

$T_{\frac{1}{2}} = 3$ hours, $T_{\text{max}} = 30-60$ minutes (oral)\textsuperscript{14}

Effects of LSD on breastfeeding

1. Little or no data are available on the transfer of LSD into breast milk. Because the drug has a low molecular weight, which should allow transfer into breast milk, and because hallucinogenic effects are produced at extremely low concentrations, the use of LSD during lactation is contraindicated.\textsuperscript{31}

Neonatal sequelae

1. LSD is likely to enter the milk and produce hallucinogenic effects in the infant.\textsuperscript{14}

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. Breastfeed the infant prior to using LSD.
2. DO NOT breastfeed after LSD use for 34-120 hours.\textsuperscript{14}
METHADONE
NARCOTIC AGONIST ANALGESIC

Lactation Risk: L3 (Probably safe)\(^1\)
Briggs et al: No (Limited) Human Data – Probably Compatible\(^3\)
\(T\frac{1}{2} = 13-55\) hours, \(T_{\text{max}} = 0.5-1\) hour\(^4\)

Methadone is commonly used in maintenance therapy programs for dependence on narcotics. Daily dispensing is the usual recommendation during pregnancy and breastfeeding in order to keep blood levels consistent and decrease the risk of women sharing or selling their take home doses\(^6\). Breast milk contains only small amounts of methadone and mothers can be encouraged to breastfeed regardless of methadone dose provided that they are not using other drugs\(^5\).

Effects of methadone on breastfeeding

1. Maternal blood methadone levels and methadone excretion in breast milk vary between individuals with studies showing that only small amounts of methadone is found in breast milk despite high doses up to 105mg/day of methadone.
2. A study by Jansson et al. (2008) found that women on methadone who breastfeed past the neonatal period had a small concentration of methadone in their breast milk and that the potential exposure to the infant is low and is not likely to have a detrimental effect on the developing child\(^5\).

Neonatal sequelae

1. Breast milk contains only small amounts of methadone and mothers can be encouraged to breastfeed regardless of methadone dose provided that they are not using other drugs\(^2\).
2. Breastfeeding may reduce the severity of the neonatal abstinence syndrome\(^3\).
3. Advise the mother to seek medical advice if her child appears sedated.
4. Observe the infant for sedation, respiratory depression, neonatal abstinence syndrome\(^4\).

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. Maintain methadone treatment regime.
2. Breastfeed infant prior to using daily methadone dose\(^3\).
3. Avoid breastfeeding for 2-4 hours after methadone dose when blood levels are at their highest\(^3\).
4. Inform mothers about the possible effects of higher methadone doses or resumed polydrug use whilst breastfeeding.
5. Educate mothers to recognise the symptoms of NAS.
6. Monitor the infant for signs/symptoms of withdrawal from methadone (NAS).
7. Women receiving high doses of methadone should be advised to wean their babies slowly to avoid withdrawal symptoms in the infant\(^3\).
NICOTINE (INCLUDING NICOTINE PATCHES AND GUM)  
CENTRAL NERVOUS SYSTEM STIMULANT  

Lactation Risk: Nicotine patches or gum L2 (Safer)\(^\text{14}\)  
Briggs et al: No (Limited) Human Data – Potential Toxicity\(^\text{31}\)  
\(T\frac{1}{2} = 2\text{ hours \ (non-patch)}, \ T_{\text{max}} = 2\text{-}4\text{ hours}\)\(^\text{14}\)  

Although the risks associated with smoking are widely publicised, over 25% of the world’s population smoke cigarettes.\(^\text{35}\) Nicotine and its metabolite cotinine have both been identified in breast milk.\(^\text{14}\) is present in milk in concentrations of between 1.5 and 3.0 times the simultaneous maternal plasma concentration and elimination half-life is 60 to 90 minutes in both milk and plasma. There is no evidence to document whether this amount of nicotine presents a health risk to the nursing infant.\(^\text{17}\)

Effects of nicotine on breastfeeding  
1. Nicotine is quickly absorbed after maternal smoking.\(^\text{35}\)  
2. Nicotine and its metabolite cotinine are excreted into breast milk in amounts proportional to the number of cigarettes smoked by the mother.\(^\text{35}\)  
3. Smokers produce lower milk volumes, have lower milk fat content, use formula supplements more often, and wean their infants from breastfeeding earlier than non-smokers, partly due to nicotine lowering maternal basal prolactin concentrations.\(^\text{13}\)

Neonatal sequelae  
1. Infants of smoking mothers have increased infantile colic and decreased respiratory rates and oxygen saturation following breastfeeding, as well as being more prone to respiratory infections.\(^\text{11}\)  
2. Findings from one study in which mothers used a 7-mg patch to assist tobacco cessation suggest that the absolute infant dose of nicotine and its metabolite cotinine decreased by approximately 70% of that observed when the mothers were smoking or using a 21-mg patch.\(^\text{14}\)  
3. Nicotine gum appears to reduce maternal serum nicotine levels to around 30-60% that of cigarette smokers but produces large variations in peak levels when the gum is chewed rapidly in comparison to the sustained and lower level of release observed with the patches.\(^\text{14}\)  
4. The risk of using nicotine patches whilst breastfeeding is much less than the risk of formula feeding.\(^\text{14}\)  
5. There is some evidence to suggest that breastfeeding and smoking is less detrimental to the child than bottle feeding and smoking.\(^\text{14}\)  
6. Breastfeeding reduces the risk of respiratory illness by half that of formula-fed infants of smokers.\(^\text{13}\)

HARM MINIMISATION STRATEGIES  

Additional harm minimisation strategies for breastfeeding  
1. Quit smoking tobacco if possible.  
2. Advise mothers to limit smoking as much as possible and smoke only after the infant has been fed, or switch to nicotine patches.\(^\text{14}\)  
3. Smoke outside the house or car.  
4. Breastfeed exclusively for the first six months to maximise the infant’s protection against respiratory disease.  
5. Avoid smoky environments.
PHENCYCLIDINE (PCP, ANGEL DUST, OZONE, ROCKET FUEL)

HALUCINOGEN

Lactation Risk: L5 (Hazardous)\textsuperscript{14}

Briggs et al: Contraindicated\textsuperscript{31}

T½ = 24-51 hours, T\textsubscript{max} = Immediate\textsuperscript{14}

PCP was developed in the 1950s as an intravenous anaesthetic. Its use in humans was discontinued in 1965, because patients often became agitated, delusional, and irrational while recovering from its anaesthetic effects. Illegally manufactured PCP is sold on the street by such names as angel dust, ozone, wack, and rocket fuel. Killer joints and crystal super grass are names that refer to PCP combined with marijuana.\textsuperscript{55}

At low to moderate doses, physiological effects include a pronounced rise in blood pressure and pulse rate. Breathing becomes shallow; flushing and profuse sweating occurs. Generalised numbness of the extremities and loss of muscular coordination may also occur.\textsuperscript{35}

PCP has sedative effects and interactions with other central nervous system depressants such as alcohol and benzodiazepines can lead to coma.

Effects of PCP on breastfeeding

1. PCP is stored in fatty tissue.\textsuperscript{14}
2. In animal studies milk concentrations of PCP were 10 times those of plasma.\textsuperscript{14}
3. PCP has been found in breast milk several weeks after maternal dosing. This is attributable to its long half-life and is therefore contraindicated.\textsuperscript{14}

Neonatal sequelae

1. Irritability, jitteriness, hypertonicity and poor feeding are common features in infants born to PCP-using mothers.\textsuperscript{31}
2. PCP is extremely dangerous to a breastfed infant and nursing mothers should be encouraged to avoid it.\textsuperscript{14, 31}

HARM MINIMISATION STRATEGIES

Additional harm minimisation strategies for breastfeeding

1. Avoid breastfeeding after PCP use as a sufficient duration of abstinence has not been defined.\textsuperscript{14}
2. Advise PCP-using mothers not to breastfeed.\textsuperscript{17}
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